What is Claimed:

1. A method of determining a phase between a first signal and a second signal, the first signal and the second signal corresponding to signal transmissions between a first device and a second device, the second device periodically moving along a translational axis with respect to the first device in a first direction or a second direction, the method comprising the steps of:

assigning a positive or negative value to each of a plurality of positive and negative zero crossings of the first signal, a positive zero crossing being assigned a positive value if the second signal is negative or a negative value if the second signal is positive, and a negative zero crossing being assigned a positive value if the second signal is positive or a negative value if the second signal is negative;

counting a numerator for a predetermined interval, the numerator being counted in a positive direction if the second device is moving in the first direction and the value assigned to a corresponding zero crossing of the first signal is negative or if the second device is moving in the second direction and the value assigned to the corresponding zero crossing is positive, the numerator being counted in a negative direction if the second device is moving in the first direction and the value assigned to the corresponding zero crossing is positive or if the second device is moving in the second direction and the value assigned to the corresponding zero crossing is negative;

counting a denominator for the predetermined interval, the denominator being counted in a positive direction; and

calculating a raw phase between the first signal and the second signal by dividing a value of the numerator by a corresponding value of the denominator after the predetermined interval.

2. The method of claim 1 wherein said calculating step includes calculating a raw phase between the first signal and the second signal by dividing the value of the numerator by the value of the denominator at each positive crossing of the first signal.

3. The method of claim 1 further comprising the step of:

detecting a polarity of each crossing of the first signal during the predetermined interval.

4. The method of claim 1 wherein said counting a numerator step includes counting the numerator when either, but not both, of the first signal and the second signal has a positive value.

5. The method of claim 1 wherein the predetermined interval corresponds to an interval between positive zero crossings of the first signal.

6. The method of claim 1 wherein the translational motion of the second device with respect to the first device causes the phase between the first signal and the second signal to periodically alternate.

7. The method of claim 1 further comprising the step of:

providing a signal for correcting for relative rotational motion between the first and second devices using the calculated raw phase or a calculated unwrapped phase, the unwrapped phase being related to the calculated raw phase.

8. The method of claim 1 further comprising the step of:

converting a first and a second analog signal to the first and second signals respectively, the first and second signals being digital signals.

9. The method of claim 1 further comprising the step of:

resetting the numerator and the denominator after the predetermined interval.

10. The method of claim 1 wherein said calculating step includes repeatedly calculating the raw phase for each of a successive plurality of the predetermined interval.

11. The method of claim 10 wherein ±360°k are added to the calculated raw phase if a difference between the raw phase calculated at successive predetermined intervals exceeds a predetermined value.

12. A digital phase detector for determining a phase between a first signal and a second signal, the first signal and the second signal corresponding to signal transmissions between a first device and a second device, the second device periodically moving along a translational axis with respect to the first device in a first direction or a second direction, said digital phase detector comprising:

a polarity determiner for assigning a positive or negative value to each of a plurality of positive and negative zero crossings of the first signal, said polarity determiner assigning a positive zero crossing a positive value if the second signal is negative or a negative value if the second signal is positive, said polarity determiner assigning a negative zero crossing a positive value if the second signal is positive or a negative value if the second signal is negative;

a numerator counter for counting for a predetermined interval, the numerator counter counting in a positive direction if the second device is moving in the first direction and the value assigned to a corresponding zero crossing of the first signal is negative or if the second device is moving in the second direction and the value assigned to the corresponding zero crossing is positive, the numerator counter counting in a negative direction if the second device is moving in the first direction and the value assigned to the

corresponding zero crossing is positive or if the second device is moving in the second direction and the value assigned to the corresponding zero crossing is negative;

a denominator counter for counting in a positive direction for the predetermined interval; and

a raw phase calculator for calculating a raw phase between the first signal and the second signal by dividing a value of the numerator counter by a corresponding value of the denominator counter after the predetermined interval.

13. The digital phase detector of claim 12 wherein said raw phase calculator calculates the raw phase between the first signal and the second signal by dividing the value of the numerator counter by the value of the denominator counter at each positive crossing of the first signal.

14. The digital phase detector of claim 12 additionally comprising:

a zero crossing detector for detecting zero crossings of the first signal during the predetermined interval.

15. The digital phase detector of claim 12 wherein said numerator counter operates when either, but not both, of the first signal and the second signal has a positive value.

16. The digital phase detector of claim 12 wherein the predetermined interval corresponds to an interval between positive zero crossings of the first signal.

17. The digital phase detector of claim 12 wherein the translational motion of the second device with respect to the first device causes the phase between the first signal and the second signal to periodically alternate.

18. The digital phase detector of claim 12 wherein said raw phase value calculated by said raw phase calculator, or an unwrapped phase value calculated based on said raw phase value, is used to provide a signal for correcting for relative rotational motion between the first and second devices.

19. The digital phase detector of claim 12 additionally comprising:

a converter for converting a first and a second analog signal to the first and second signals respectively, the first and second signals being digital signals.

20. The digital phase detector of claim 12 wherein said numerator counter and said denominator counter are reset after the predetermined interval.

21. The digital phase detector of claim 12 wherein said raw phase calculator repeatedly calculates the raw phase for each of a successive plurality of the predetermined interval.

22. The digital phase detector of claim 21 additionally comprising:

a second raw phase calculator for adding $\pm 360°k$ to the calculated raw phase if a difference between the raw phase calculated at successive predetermined intervals exceeds a predetermined value.